USER MANUAL

FMUX-03A

Fiber Optical Multiplexer
Standalone / Rack Type
4, 8, 12 or 16 Channel Modular Design
G.703 E1, Datacom V.35, X.21, RS-530,
RS-449, RS-232, FXO/FXS
SNMP Manageable

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FMUX-03A
Platform fiber multiplexer with 4, 8, 12, 16 channels E1, Data communication, or FXO/FXS.
Installation and Operation Manual
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This manual supports the following models:

FMUX-03A

This document is the third official release manual. Please check CTC Union's website for any updated manual or contact us by E-mail at info@ctcu.com. Please address any comments for improving this manual or to point out omissions or errors to marketing@ctcu.com. Thank you.

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1 Chapter 1 Introduction

1.1 Overview

Thank you for choosing the modularized high-capacity multi-service fiber transmission platform.

The fiber transmission platform is a PDH fiber optic multiplexer, a fully new designing concept to challenge the existing high capacity PDH. The powerful ASIC integrates 16 E1 channels, a full rate 100Mbps Ethernet channel and a clear asynchronous RS-232 data channel into one fiber optical link. And the absolute modular structure provides the most flexible combination for customer's application and keeps the expending capacity for future upgrade.

The equipment is the best solution on cost-efficiency to extend traditional leased-line E1 signals and Ethernet data link after SDH topology, it offers a multi-services platform for customer's demand of broadband access and relative low cost to SDH products.

The equipment provides two slots of optical link for hot swappable optical interface cards, which can perform optional 1+1 auto protection switch (APS) and optical interface ALS (Automatic Laser Shutdown/Reduction). The appropriate optical interface cards may be selected to support multi-mode or single-mode fiber cable operation, with a variety of transceiver power and connector options including SC, FC. WDM (Wave Division Multiplexing) optical interfaces are also available to provide bidirectional transmission on a single fiber to reduce cost when using leased fiber links. The range of transmission for optical connection is from 2Km (for multi-mode) up to 120Km (single mode).

The equipment provides 4 slots of tributary with variant plug-in modules which include 4-channel E1 module, 4-channel FXO/FXS module and 4-channel V35 module. The maximum capacity will be up 4 plug-in modules which could be combinations with above modules.

And the 100Mbps Ethernet data link is an extra channel to be multiplexed into an optical link, it doesn't waste E1 channels to carry Ethernet link during optical transmission. According to network application, the equipment can offer diversified combinations for audio/date/video services.

The high flexibility, performance and C/P value, The equipment is the best solution for voice/data/video services in existing market.

1.1.1 Function Indication

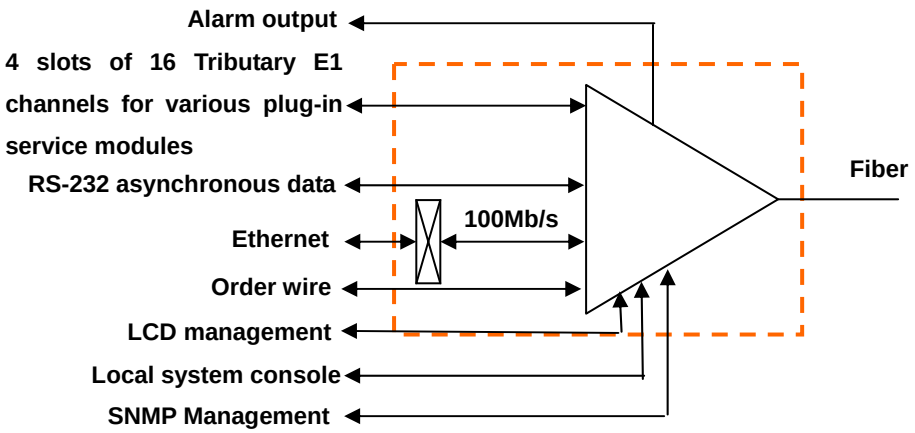


Figure 1-1 Function Indication

1.1.2 Applications

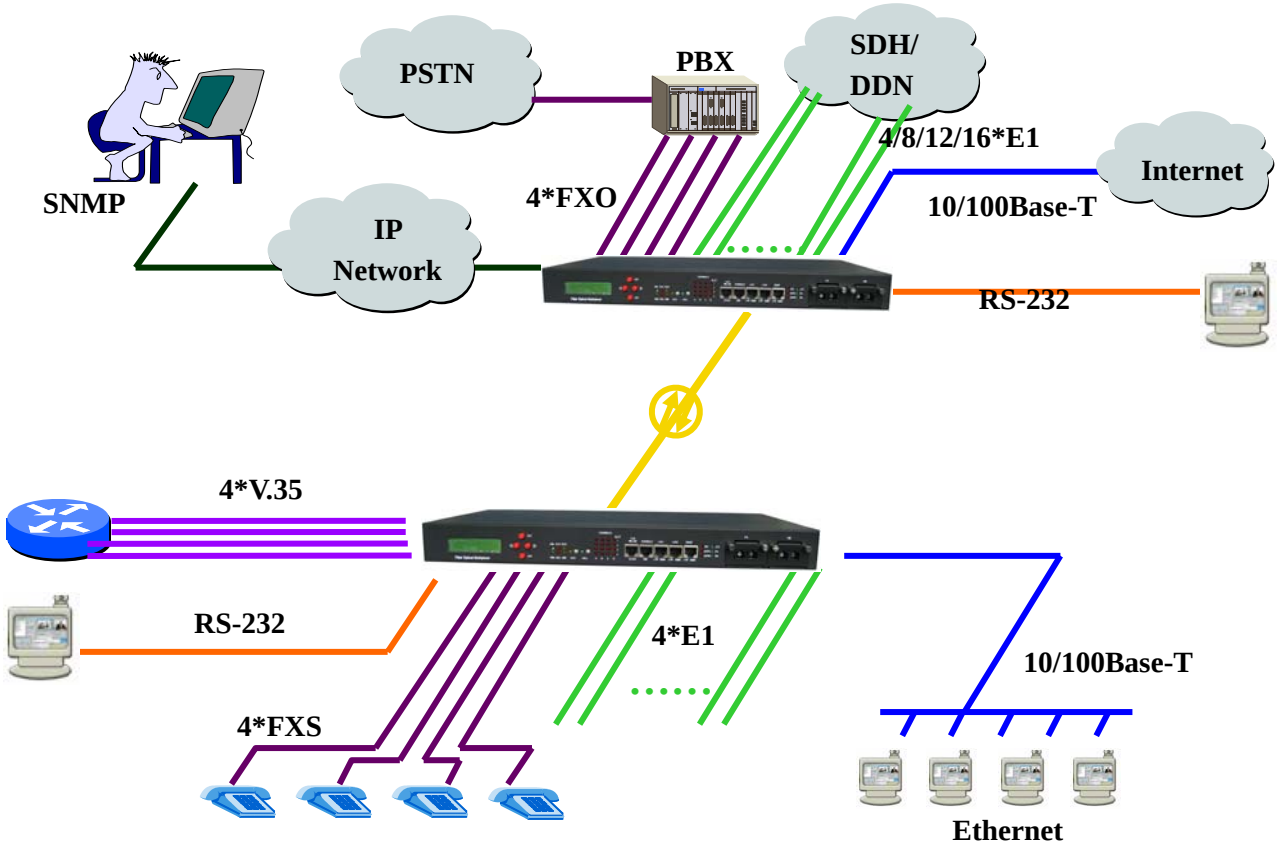


Figure 1-2 Point-to-Point Application

1.1.3 Function Description

- Multiplexer of 16*E1 (2.048Mb/s) channels, 1 full rate 100Mbps Ethernet channel and a clear asynchronous RS-232 data channel
- Providing 1 RS-232 port or system console
- Providing 1 alarm output port, 1 order wire port
- Providing Windows™ based GUI SNMP network management program when a SNMP management card has been installed inside the chassis
- Providing controllable menu of LCD
- Providing 4 plug-in I/O slots, each slot can use the following service cards:
  - 4-channel E1(75Ω) Module, providing BNC connectors for E1 line interface connections and supporting 4 separate E1 channels t a transmission rate of 2.048Kbps each
  - 4-channel E1(120Ω) Module, providing RJ-45 connectors for E1 line interface connections and supporting 4

separate E1 channels at a transmission rate of 2.048Kbps each

- 4-channel V.35 Module, providing 4 standard V.35, up to 2.048Mbps for V.35 DCE port for direct connection to terminal equipments
- 4-channel FXO voice Module, providing 4 RJ-11 connectors for FXO interface connections and supporting 4 separate voice channels, cooperating with 4-channel FXS voice module in the other side
- 4-channel FXS voice Module, providing 4 RJ-11 connectors for FXS interface connections and supporting 4 separate voice channels, cooperating with 4-channel FXO voice module in the other side

- Providing two 10/100Mbps Ethernet ports, working in force/auto-negotiation mode
- Providing 2 plug-in I/O slots for optical interface cards:
  - Transmission distance is up to 120KM
  - Each optical interface card is hot-swappable
  - APS (Automatic Protection Switching) function for dual optic interface card configuration
  - Optional ALS（Automatic Laser Shutdown/Reduction）function for each optical interface card
  - Optional single-mode or multi-mode optical interface card
  - Optional standard or WDM optical interface card
  - Optional SC or FC connectors for optical interface connection
- Providing up to 5 kinds of clock sources
- Providing in-band remote management from the local unit when the fiber optical links are established
- Providing local and remote loop back control for tributary links and optical links
- Providing E1 LOS alarming, coding error detection
- Single-board products: 19 inch, 1U, small volume, small weight, convenient to transport and installation
- Desktop or rack-mountable for 19 inch rack
- Power supply: single AC 90~260VAC, single DC -20~-60VDC, 90~260VAC and -20~-60VDC dual power supply

1.2 Physical Description

1.2.1 Front panel

Figure 1-3 Front panel view

1.2.2 Rear panel

Figure 1-4 Rear panel view

1.2.3 Physical Structure

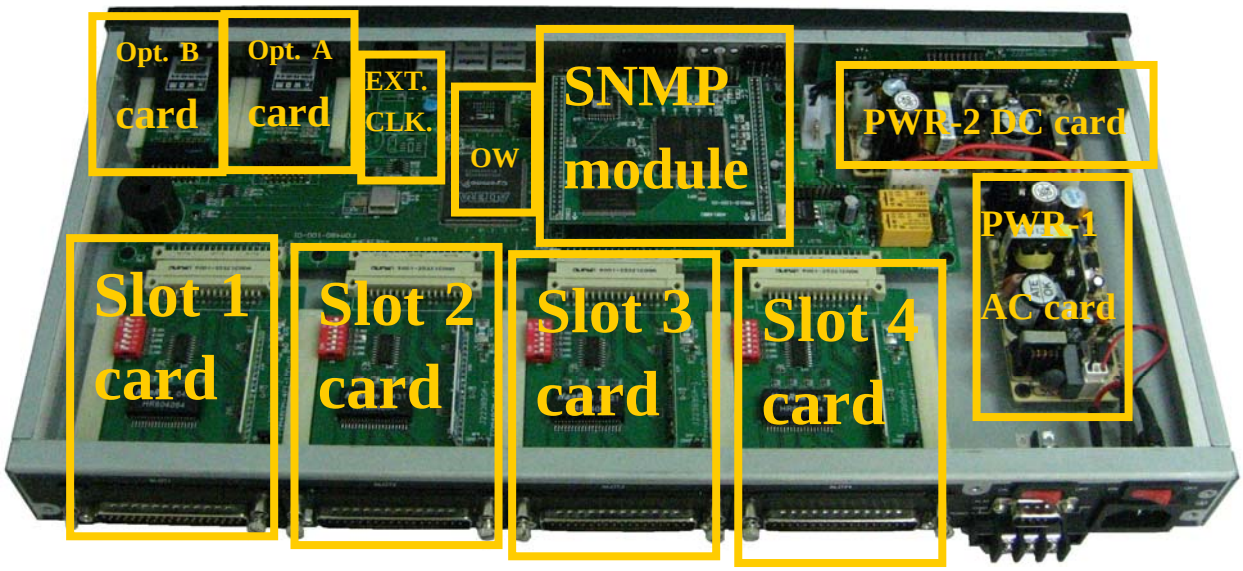


Figure 1-5 Structure

1.2.4 Part List

Table 1-1 Part list

Describe : It is a base unit.					
Base Unit	Plug-in Name		Amount	Model	Specification
	Chassis		1		
	Cover		1		
	Package	Plastic	1		
		Foam	2		
		Box	1		
	DB9 (female)		2		
	DISC		1		
	Manual		1		

Describe : Optional Fiber Optical module				
Optical Unit	Type	KM	Model	Specification
	WDM	20	OM/480 - 20KS3	Tx 1310nm, Rx 1550nm, SC/PC and FC/PC connector optional
			OM/480 - 20KS5	Tx 1550nm, Rx 1310nm, SC/PC and FC/PC connector optional
		40	OM/480 - 40KS3	Tx 1310nm, Rx 1550nm, SC/PC and FC/PC connector optional
			OM/480 - 40KS5	Tx 1550nm, Rx 1550nm, SC/PC and FC/PC connector optional
		60	OM/480 - 60KS3	Tx 1310nm, Rx 1550nm, SC/PC and FC/PC connector optional
			OM/480 - 60KS5	Tx 1550nm, Rx 1310nm, SC/PC and FC/PC connector optional
		80	OM/480 - 80KS3	Tx 1310nm, Rx 1550nm, SC/PC and FC/PC connector optional
			OM/480 - 80KS5	Tx 1550nm, Rx 1310nm, SC/PC and FC/PC connector optional
	Standard	20	OM/480 - 20K	1310nm, SC/PC and FC/PC connector optional
		40	OM/480 - 40K	1310nm, SC/PC and FC/PC connector optional
		60	OM/480 - 60K	1310nm, SC/PC and FC/PC connector optional
		80	OM/480 - 80K	1550nm, SC/PC and FC/PC connector optional
		100	OM/480 - 100K	1550nm, SC/PC and FC/PC connector optional
		120	OM/480 - 120K	1550nm, SC/PC and FC/PC connector optional
NOTE: WDM type must match S3 with S5 in pairs; ALS function is optional for all models				

Describe : Optional I/O Operation module					
Tributary Unit	Interface	Connector	Account	Model	NOTE
	4E1 (75Ω)	DB-37		EM/480 - 4EUB	Hot-swappable
	4E1 (120Ω)	DB-37		EM/480 - 4EBL	Hot-swappable
	V.35	DB-62		EM/480 - V.35	Hot-swappable
	4FXS	RJ11		EM/480 - 4FXS	Hot-swappable
	4FXO	RJ11		EM/480 - 4FXO	Hot-swappable

Describe : Optional management module				
Control Unit	Name	Account	Model	Function
	SNMP module		CM/480 - SNMP	SNMP management
	OW module		CM/480 - V	Engineering order wire phone
	E. CLK module		CM/480 - E.CLK	External clock input

Describe : Optional power module				
Power Unit	Name	Account	Model	Function
	AC power module		P/480-AC	90~260VAC, 50 Hz, 20W
	DC power module		P/480-48	-20V ~ -60VDC, 20W

1.3 Technical Specifications

1.3.1 General interfaces and ports

Table 1-2 General ports

Port	Function Description
LCD	LCD control panel and menu keys in the front panel, local/remote devices management
RS-232 data and E.CLK input	One clear asynchronous RS-232 data channel and the external clock input interface, the first RJ-45 port in the front panel from left to right
CONSOL and OW	One asynchronous RS-232 console port and the order wire telephone interface, connected to COM port of PC for RS-232 console, RJ-45 jack; SNMP agent card configuration, local/remote devices management and maintenance, the second RJ-45 port in the front panel from left to right
LAN1~2	2 10/100M Ethernet ports, RJ-45 jacks, the third and fourth RJ-45 ports in the front panel from left to right
SNMP	SNMP management port according to TCP/IP, RJ-45 jack; available only when a SNMP module is installed in the PCB, the fifth RJ-45 port in the front panel from left to right
FIA/FIB	For optical interface modules, optional optical module with/without ALS, hot swap, 1+1 redundancy protection, located in the right front panel
I/O slot 1~4	Tributary 4 channels in each slot for 4*E1(75Ω) Module, 4*E1(120Ω) Module, 4*V.35 Module, 4*FXO/4*FXS voice Modules, located in the rear panel
Alarm	Connecting external audible/visual alarm equipment, located in the rear panel

1.3.2 RS-232 data and E.CLK port

The unit provides an RJ-45 jack for both one clear asynchronous RS-232 data channel and the external clock input.

Table 1-3 RS-232 data and E.CLK port specification

RS-232 data	Mode	Baud rate	Data bit	Parity bit	Stop bit	Flux control	PINOUTS		
							TX	RX	GND
	Asynchronous	Auto-sensing, up to 57600bps	Auto-sensing			Software control	3	6	4, 5
E. CLK	Rx+ (R Tip)				Rx- (R Ring)				
	1				2				

NOTE:

1. The pinouts here is just for the RJ-45 jack, there is special cable for RS-232 data and external clock connection. Please refer to relative section in Chapter 2.
2. The hardware control of RS-232 data port can be realized by a special extra cable.
3. The external clock input is available only when an external clock module is planted in the PCB.

1.3.3 CONSOLE and OW Port

The unit provides an RJ-45 jack for both RS-232 console and order wire of the unit.

Table 1-4 Console and OW port specification

RS-232 console	Mode	Baud rate	Data bit	Parity bit	Stop bit	Flux control	PINOUTS		
							TX	RX	GND
	Asynchronous	19200bps	8	NO	1	NO	3	6	4, 5

OW	Voice output (PO-)	Voice output (PO+)	Voice input (DRR)	GND
	1	2	8	4, 5

Pin 7: Console switch (SWSER)	RS-232 console performs as mainboard console when PIN 7 is disconnected to GND; and as SNMP module console when PIN 7 is connected to GND

NOTE:

1. The pinouts here is just for the RJ-45 jack, there is special cable for RS-232 console and order wire connection. Please refer to relative section in Chapter 2.
2. The telephone transceiver should be directly connected to the order wire port.
3. When the CALL button in one side is pressed down, there will be a telephone-in ring in the other side. Press down the CALL button in the other side, then operators in both sides can talk over the telephone.
4. The order wire needs -48VDC power supply and is invalid when using only AC power supply.

1.3.4 Ethernet Interface

Table 1-5 Ethernet interface specification

Function	1 full rate 100Mbps channel for 2 Ethernet ports, bridge mode, support MAC filtering, support VLAN trunk
Standard	IEEE 802.3 802.3u 802.1q
Interface	Ethernet and Fast Ethernet, auto-MDI/MDI-X
Baud rate	Full rate 10/100Mbit/s, auto-adjusting/force mode
Duplex Mode	force or Auto-Negotiation on Half / Full Duplex Mode
Connector	RJ-45 jack
Frame Length	64byte(least)/1536byte(most)
MAC Address	1K
MAC Address Update	5 Minutes

Table 1-6 Ethernet port working mode when cooperating with peripheral equipments

LAN port setting mode	***peripheral equipments setting mode***	***LAN port real working mode***	***peripheral equipments real working mode***	***Effect***
A/N	A/N	100M FD	100M FD	perfect
100M FD	100M FD	100M FD	100M FD	perfect
10M FD	10M FD	10M FD	10M FD	perfect
100M HD	100M HD	100M HD	100M HD	perfect
10M HD	10M HD	10M HD	10M HD	perfect

A/N	100M HD	100M HD	100M HD	good
A/N	10M HD	10M HD	10M HD	good
A/N	100M FD	100M HD	100M FD	unfitting
A/N	10M FD	10M HD	10M FD	unfitting
NOTE: A/N(auto-negotiation) FD(full duplex) HD(half duplex)				

Table 1-7 Throughput Test

Frame Size	Passed Rate(%)	01 to 02 （pks/sec）	02 to 01 (pks/sec)	Total
		100M -100M	100M -100M	
64	100.00	148810	148810	297620
128	100.00	84459	84459	168918
256	100.00	45290	45290	90580
512	100.00	23496	23496	46992
1024	100.00	11973	11973	23946
1280	100.00	9615	9615	19230
1518	100.00	8127	8127	16254
1536	100.00	8033	8033	16066

Table 1-8 Packet Loss Test

Frame Size	Rate Tested(%)	01 to02 (%)	02 to01 (%)	Average
		100M -100M	100M -100M	
64	100.00	0.000	0.000	0.000
128	100.00	0.000	0.000	0.000
256	100.00	0.000	0.000	0.000
512	100.00	0.000	0.000	0.000
1024	100.00	0.000	0.000	0.000
1280	100.00	0.000	0.000	0.000
1518	100.00	0.000	0.000	0.000
1536	100.00	0.000	0.000	0.000

Table 1-9 Latency Test

Frame Size	Rate Tested(%)	01 to02 (us)-CT	Average (CT)	01 to 02 (us)-S&F	Average (S&F)
		100M -100M		100M -100M	
64	100.00	100.3	100.3	95.1	95.1
128	100.00	110.6	110.6	100.4	100.4
256	100.00	131.1	131.1	110.6	110.6
512	100.00	172.0	172.0	131.1	131.1
1024	100.00	253.5	253.5	171.6	171.6
1280	100.00	294.8	294.8	192.3	192.3
1518	100.00	332.9	332.9	211.5	211.5
1536	100.00	335.7	335.7	212.9	212.9

Table 1-10 Back- to-Back Test

Frame Size	Rate Tested(%)	01 to02 Burst Size (frames)	02 to01 (frames)	Total
		100M -100M	100M -100M	
64	100.00	297620	297620	595240
128	100.00	168918	168918	337836
256	100.00	90580	90580	181160
512	100.00	46992	46992	93984
1024	100.00	23946	23946	47892
1280	100.00	19230	19230	38460
1518	100.00	16254	16254	32508
1536	100.00	16066	16066	32132

1.3.5 SNMP management Port

Table 1-11 SNMP port specification

Function	SNMP management of local and remote devices
Interface	Ethernet and Fast Ethernet, auto-MDI/MDI-X
Baud rate	10/100Mbit/s, auto-sensing
Duplex Mode	Auto-Negotiation on Half / Full Duplex Mode
Connector	RJ-45 jack

NOTE:

1. SNMP management port is available only when a SNMP agent card is planted in the PCB.

1.3.6 Alarm relay port

This unit provides one DB-9 male connector in the rear panel for 4 groups of alarm outputs. When connected in a circuit containing an external alarming device, the external alarming device will alarm if the unit has a fault.

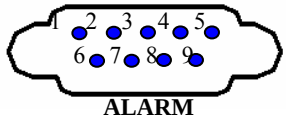


Table 1-12 Alarm output interface specification

	Output Pins	Voltage	Current
Major audible alarm	1、2 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Major visible alarm	3、4 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Minor audible alarm	6、7 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Minor visible alarm	8、9 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input

Table 1-13 Alarm specification

		Alarm information	Major	Minor
Local unit	Optical interface	SYS	√	
		RDI	√	
		LOS	√	
		LOF	√	
		AIS		√
		LCK		√
		BE	√	√
	Tributary interface	AIS		√
		CV	√	
		LOS	√	
		LOF		√
Remote unit				√

1.3.7 Optical module

This unit provides two slots in the right front panel for optical interface modules.

Table 1-14 General specification of optical module

Function	optional optical module with/without ALS, hot swap, 1+1 redundancy protection
Baud rate	150Mb/s±50ppm
Coding	NRZ
Transmission medium	G.652 optical fiber
Operation temperature	-20℃ ~ +70℃

Table 1-15 Details for different module

WDM									
Type	***Model***	***Distance***	***Wavelength***	***Output power***	***Sensibility***	***Power margin***	***Return Loss***	***Connector***	
								SC/PC	FC/PC
Single mode	OM/480 - 20KS3	20Km	Tx: 1310nm Rx: 1550nm	-15 ~ -8dBm	-30dBm	20dB	-15dBm	yes	yes
	OM/480 - 20KS5	20Km	Tx: 1550nm Rx: 1310nm	-15 ~ -8dBm	-30dBm	20dB	-15dBm	yes	yes
	OM/480 - 40KS3	40Km	Tx: 1310nm Rx: 1550nm	-8 ~ 0dBm	-31dBm	28dB	-15dBm	yes	yes
	OM/480 - 40KS5	40Km	Tx: 1550nm Rx: 1310nm	-10 ~ 0dBm	-31dBm	28dB	-15dBm	yes	yes
	OM/480 - 60KS3	60Km	Tx: 1310nm Rx: 1550nm	-5~2dBm	-31dBm	28dB	-15dBm	yes	yes
	OM/480 - 60KS5	60Km	Tx: 1310nm Rx: 1550nm	-8~2dBm	-31dBm	28dB	-15dBm	yes	yes
	OM/480 - 80KS3	80Km	Tx: 1310nm Rx: 1550nm	-1~2dBm	-36dBm	35dB	-15dBm	yes	yes
	OM/480 - 80KS5	80Km	Tx: 1310nm Rx: 1550nm	-8~-3dBm	-38dBm	35dB	-15dBm	yes	yes
Standard									
Type	***Model***	***Distance***	***Wavelength***	***Output power***	***Sensibility***	***Power margin***	***Return Loss***	***Connector***	
								SC/PC	FC/PC
Multi-mode	OM/480 - 2K	0~2 Km	1310nm	-22~-18dBm	-31dBm	11dB	-15dBm	yes	yes
Single-mode	OM/480 - 20K	15~20 Km	1310nm	-18~-7 dBm	-31dBm	20dB	-15dBm	yes	yes

	OM/480 - 40K	20~40 Km	1310nm	-15 ~ 0dBm	<-31dBm	20dB	-15dBm	yes	yes
	OM/480 - 60K	40~60K m	1310nm	-5 ~ 0dBm	<-36dBm	33dB	-15dBm	yes	yes
	OM/480 - 80K	60~80 Km	1550nm (DFB)	-5 ~ 0dBm	<-34dBm	32dB	-15dBm	yes	yes
	OM/480 - 100K	80~120 Km	1550nm (DFB)	-5 ~ 0dBm	<-34dBm	32dB	-15dBm	yes	yes
	OM/480 - 120K	100~120 Km	1550nm (DFB)	-1 ~ 4dBm	<-34dBm	34dB	-15dBm	yes	yes

NOTE:

1. WDM type must match S3 with S5 in pairs.
2. For the optical modules with ALS function, ALS can be activated or disabled via the front panel LCD, console terminal mode or SNMP management (when SNMP option is installed).

1.3.8 4*E1 Module

Figure 1-6 4*E1 modules

Table 1-16 4*E1 module specification

Function	Provide 4 tributary E1 ports
Framing	Unframed (transparent)
Standard	ITU-T G.703, G.704, G.823 and G.742
connector	BNC female connectors for 75Ω coaxial cable , DB-37 female connector with 1 to 8*BNC (or 4*RJ-45) header adapter cable; RJ-45 jack for 120Ω twisted pair
Code	HDB3
Baud rate	2048 Kbps ± 30ppm
Transmit Level	According to G.703
Impedance	75Ω for unbalanced (BNC coaxial cable) 120Ω for balanced (RJ-45 twisted pair)
Receiving sensitivity	0~-18dBm
Transmit high voltage	2.37V± 10%, 75Ω; 3.00V± 10%,120Ω
Transmit low voltage	0 ± 0.1V
Transmitting distance	100m for coaxial cable, 200m for twisted-pair

Table 1-17 Output Jitter of E1 port

B1(20Hz~100KHz)	<0.08 UI
B2(18kHz~100KHz)	<0.05 UI

Table 1-18 Input Jitter of E1 port

Frequency(Hz)	10	20	63	130	500	1.2k	2.1k	3.7k	6.4k	11k	100k
Jitter (UI)	30.7	30	26.7	14.6	6.04	4.22	3.83	3.7	3.1	2.8	0.7

Table 1-19 Jitter Transfer characteristic of E1 port

Frequency(Hz)	20	45	65	130	260	500	1.2k	2.1k	100k
Jitter（UI）	-35.97	-42.71	-56.82	-64.43	-57.63	-57.50	-54.37	-55.12	-52.31

1.3.9 V.35 Module

Figure 1-7 V.35 module

Table 1-20 V.35 module specification

Function	Providing 4 channels of V.35; Data rate, clock source, interface type and loopback modes can be set via LCD, console terminal or SNMP management
Interface type	V.35
Data rate	n×64Kbps for each channel（1≤N≤32）,
Coding	NRZ
Connector	DB62 female connector with 1 to 4 header adapter cable: V.35 interface---- M34 female;
Timing clock	Internal clock (INT): getting the clock from the V.35module's own internal oscillator; External clock (EXT): getting the clock from external equipment such as the connected router; Recovered clock (REC): getting the clock from the NRZ channel from the mainboard;
Test loops	LLB (Local Loop Back) RLB (Remote Loop Back)

1.3.10 4-channel Voice Module (FXO and FXS)

Figure 1-8 Voice modules

Table 1-21 POTS module specification

Function	Use the A1, B1, C1 or D1 NRZ channel of mainboard for 4-channel voice service with reversed polarity charging function and call screening function, support Fax T.38 and Group III AT 2,4, 4,8, 7,2, 9,6, 14,4 Kbps, support to modem pass-through for Internet calls (V.90/V.92)
Mode	FXS and FXO, FXO connected to a central office or PBX and FXS connected to a customer telephone, each line FXO raises the same line FXS
Bandwidth	64K for each voice channel
Transmission distance	Loop line between FXS module and normal telephone (or between FXO module and PBX) is up to 300m
Connector	RJ-11 jack
Ring	When the telephone is off the hook in FXS side, side in FXO side gives the client the invitation tone to dial

Do not insert/pull out the voice module when power on. That will bring damage to the module even to the main body of the unit.

1.3.11 SNMP agent module

There is a place in the PCB for SNMP agent module. SNMP management is available only when the SNMP agent module is planted in the PCB.

Table 1-22 SNMP agent module specification

Module	***Function***	***Description***
SNMP	SNMP management	by NMS software, local/remote unit management
	RS-232 console	Set the IP address and trap address of the agent module for SNMP management

Do not insert/pull out the SNMP agent module when the power is on. That will bring damage to the module even to the main body of the unit.

1.3.12 LCD monitor

Table 1-23 LCD monitor specification

LCD	2 rows of 16 charactors screen with backlight

Command	4 menu keystokes
Function	Local and remote device management
KEY	◁ **Backward** ▷ **Forward** **ENT** **EXC**

1.3.13 Physical

Table 1-24 Physical dimension

	Height	***Width***	***Depth***	***Weight***
Device	44.45 mm/1.75 inch	441 mm/17.38 inch	223 mm/8.79 inch	2kg
Package	100 mm/3.94 inch	510 mm/20.08 inch	325 mm/12.80 inch	2.5kg

1.3.14 Power Supply

Table 1-25 Power supply specification

AC Source	165~265 VAC, 50Hz, 20W, 1A fuse
DC Source	-20~-60 VDC , 20W, 1A fuse

1.3.15 Environment

Table 1-26 Environment

Operation temperature	***Storage temperature***	***Atmospheric pressure***	***Humidity***
-10 ~ +60°C	-20~70℃	70~106Kpa	0 ~ 90%, non-condensing

2 Chapter 2 Installation and Setup

This chapter describes installation and setup procedures for FOM480.

The unit is delivered completely assembled. It is designed as a stand-alone unit and for tabletop or 19 inch frame.

After installing the unit, refer to **Chapter 3** to assure normal operation.

All the operation permit to perform only by a skilled technician who is aware of the involved hazard, including internal setting, adjustment, maintenance, and repair etc.
Always observe standard safety precautions during installation, operation, and maintenance of this product.

This product may be equipped with a laser diode. Please observe the following precautions:

- **Do not attempt to adjust the laser drive current.**
- **Do not use broken fiber-optic cables/connectors or stare at the laser beam.**
- **The use of optical equipment with this product will increase eye hazard.**

2.1 Site Requirements and Prerequisites

An AC-powered unit should be installed within 1.5m (5 ft) of an easily accessible grounded AC outlet. The outlet should furnish 90 VAC to 260 VAC.

A DC-powered unit requires -48 power source, which must be adequately isolated from the mains supply. In order to prevent a fire hazard, a suitable fuse should be installed in the VDC line.

Allow at least 90 cm (36 inch) of frontal clearance for operating and maintenance accessibility. Allow at least 10 cm (4 inch) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature of the unit is -10 ~ +50°C at relative humidity of 0~90%, non-condensing.

2.2 Installation and Setup

Disconnecting the power input before completing the device installation, card installation and interface connection.

2.2.1 To install equipment:

1. When adding service modules, please loosen the screws and take off the blank baffle, and then insert a module (Optic module, 4E1 module, N*64K module, FXS/FXO voice module) into the rail of the slot, finally tighten screws of the module baffle.
2. Fix the unit in a standard E1A 19 inch frame by the 2 lugs appended on the device.

When an optic interface or a I/O slot has no operation modules, please do not take off the blank baffle to prevent dust from entering the device.

2.2.2 Connecting the Interfaces

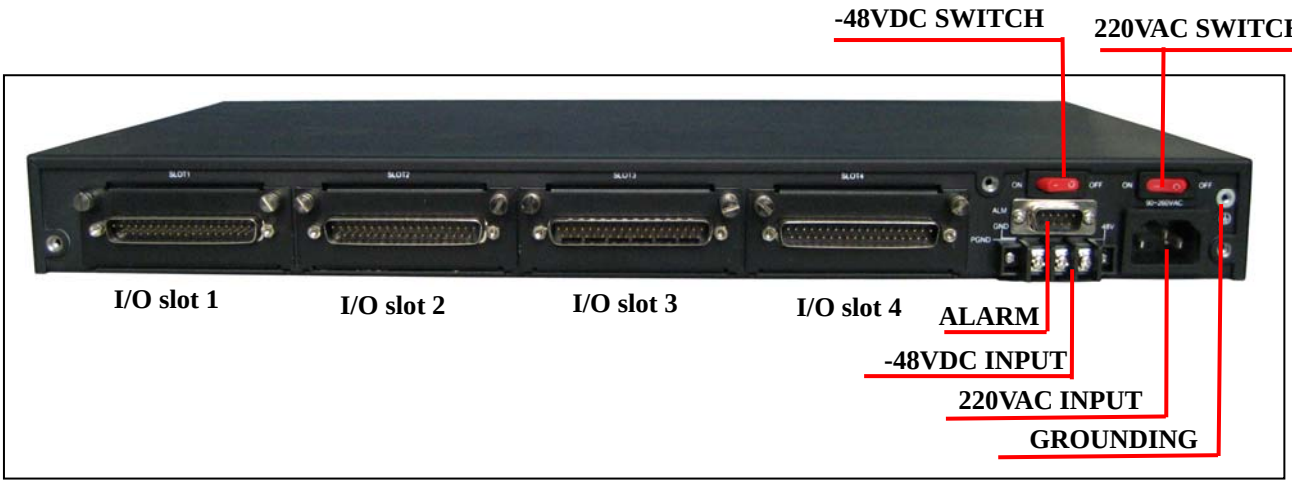


Figure 2-1 Rear panel

Table 2-1 Rear panel

Interface Type	*Explanation*
220VAC	220V AC power supply in and switch
PGND GND -48V	DC -48V power supply in and switch
ALARM	Alarm output
I/O1~4	Tributary Interface

2.2.3 Connecting the 4*E1 Module Interface:

- **To Connect the Balanced Interface:**

The 4*E1 (120Ω) module offers 4 RJ45 jacks for 120Ω E1 line connection. And the RJ-45 plugs into the RJ-45 jack for 120Ω E1 port of the third party device.

Please check the output (pin1, 2) and input (pin4, 5) lines in the RJ-45 jack of the third party device. If the E1 port is connected and the corresponding “LOS” indicator in the front panel lights red, please exchange the output (pin1, 2) and

input (pin4, 5) lines in the RJ-45 male connector.

NOTE: pin1 and pin2 must be twisted up, so do with pin4 and pin5.

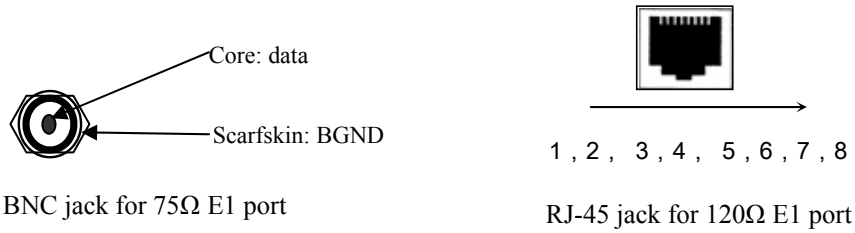
- **To Connect the Unbalanced Interface:**

The 4*E1 (75Ω) module appends a DB37F-BNC*8 (or DB37F-CC4*8)adapter cable for 75Ω E1 line connection.

DB37F-BNC*8 adapter is one DB-37 female connector to four groups of BNC (or CC4) connectors. Connect DB-37 female connector to the 4*E1 (75Ω) module DB-37 male port in the corresponding slot of the equipment rear panel.

And the BNC (or CC4) connectors to the E1 interface connectors of the third party device.

RX cables connect the TX ports and TX cables connect the RX ports. If the E1 port is connected and the corresponding "LOS" indicator in the front panel lights red, please exchange the cables.



BNC jack for 75Ω E1 port

RJ-45 jack for 120Ω E1 port

Figure 2-2 E1 connectors

2.2.4 Connecting the V.35 Module Interface

The V.35 module appends a DB62M-M34*4 adapter for V.35 interface connections.
DB62M-M34*4 adapter is one DB62 male connector to four groups of M34 connectors. Connect DB62 male connector to the V.35 Module DB62 female port in the corresponding slot of the equipment rear panel. And the M34 connectors to the V.35 interface connectors of the third party device.
Please pay attention to the pinouts sequence when join the adapter cable connectors, finally screw on the bolts. Refer to supplement for adapter cable pinouts.

2.2.5 Connecting the Fiber Optic Cables:

1. Remove the protective caps from the jacks and store them in a safe place for later use.

2. Join the transmission fiber to the jack marked TX and the received fiber to the jack marked RX.

3. At the remote unit join the transmission fiber to RX and the receive fiber to TX.

4. If the optical port is connected and the corresponding "NOP" indicator in the front panel lights red, please exchange the fibers.

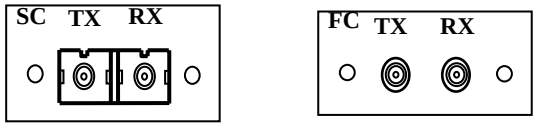


Figure 2-3 Fiber jacks

2.2.6 Connecting the RS-232 port

RS-232 port used a device management craft port, RJ-45 jack, asynchronous. The pinouts details as following.

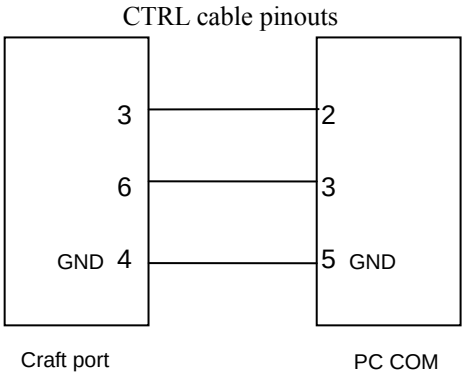


Table 2-2 Consol port pinouts

RS-232 data channel	*Pin-out*	*RS-232 craft port*
No connecting	**1,4,6**	**No connecting**
Input	**2**	**No connecting**
Output	**3**	**No connecting**
Grounding	**5**	**No connecting**
No connecting	**7**	**Grounding**
No connecting	**8**	**Input**
No connecting	**9**	**Output**

2.2.7 Connecting E.CLK port

E.CLK port is an external clock input interface, it can receive E1 PCM and E1 TTL clock from outside device and use it to synchronize the internal E1 signal

1 , 2 , 3 , 4 , 5 , 6 , 7 , 8

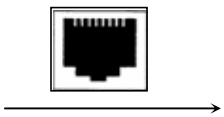
RJ-45 jack for E.CLK port

2.2.8 Connecting the Order Wire Telephone

The unit provides standard RJ-45 jack for order wire phone interfaces, and connects the handle of the telephone settings in both sides for installation and maintenance. When the order wire button in one side is pressed, there will be buzzer alarm in the other side.

NOTE

No appended telephone settings for the unit.



1 , 2 , 3 , 4 , 5 , 6 , 7 , 8

RJ-45 jack for OW port

2.2.9 Connecting the CONSOL port

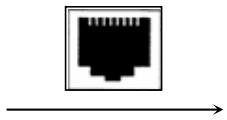
CONSOL port be used a device management craft port, RJ-45 jack, asynchronous. The pin-outs details is the as RS-232 port.

2.2.10 Connecting LAN Ports

The unit provides two full rate 100M Ethernet ports in the front panel behaving auto-adjusting in 10/100M speed, auto-negotiation on Half/Full Duplex and auto-MDI/MDI-X.
Use either a straight-through or cross-over UTP according to CAT5 EIA/TIA-568A/B for the LAN connection.
Refer to the supplement for the pinouts details.

NOTE

Hubs usually implement the crossover function internally, while network interface cards and other devices do not.



1 , 2 , 3 , 4 , 5 , 6 , 7 , 8

2.2.11 Connecting SNMP Port

The unit provides an Ethernet RJ-45 jack in the front panel for SNMP management, which supports auto-adjusting in 10/100M speed, auto-negotiation on Half/Full Duplex.
Use a straight-through UTP for a switch connection or cross-over UTP for PC connection. The pinouts of UTP should comply with CAT5 EIA/TIA-568A/B.
Refer to the supplement for the pin-outs details.

2.2.12 Connecting the Alarm Relay Port

This unit provides one DB-9 male connector in the rear panel for 4 groups of alarm outputs. When connected in a circuit containing an external alarming device, the external alarming device will alarm if the unit has a fault.

Table 2-2 Alarm output interface specification

	Output Pins	Voltage	Current
Major audible alarm	1、2 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Major visible alarm	3、4 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Minor audible alarm	6、7 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input
Minor visible alarm	8、9 pin	0~60VDC, or 0~125VAC	1A for DC input, 0.5A for AC input

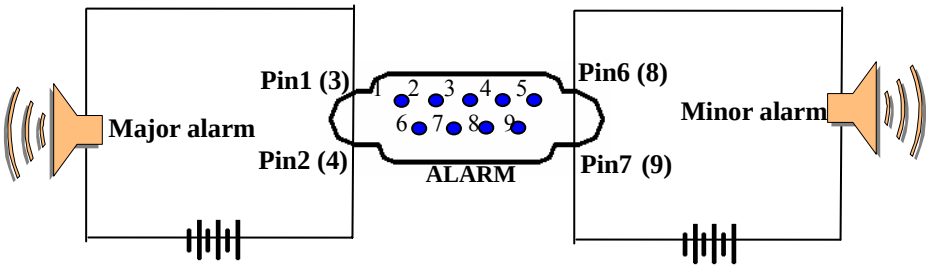


Figure 2-4 Alarming output connection

2.2.13 Connecting the Power

To connect the unit to the power source, refer to the appropriate section below, depending on your version of the unit.

This unit should always be grounded through the protective earth lead of the power cable.

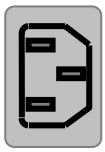
2.2.13.1 AC Power Connection

AC power is supplied to the unit through the 1.5m (5 ft) standard power cable terminated by a standard 3-prong plug. The cable is provided with the unit.

Before connecting AC power to this unit, the mains plug should only be inserted in a socket outlet provided with a protective earth contact. The protective action must not be negated by use of an extension cord (power cable) without a protective conductor (grounding). Interrupting the protective (grounding) conductor (inside or outside the unit), or disconnecting the protective earth terminal can make this unit dangerous.

- **To connect AC power:**

1. Connect the power cable to the power socket on the rear panel.
2. Connect the power cable to the mains outlet.
3. Turn on the mains switch of the unit.



NOTE

It can not sustain the voice module

2.2.13.2 DC Power Connection

- **To connect DC power:**

Certain DC-powered units are equipped with a plastic 3-screw terminal block located on the rear panel. Connect the wires of your power supply cable to the 3-screw terminal block, according to the voltage polarity and assembly instructions provided below.

➢ **Preparing and Connecting the Power supply wires**

1. Strip the insulation of your power supply wires according to the dimensions shown.
2. Place each wire lead into *VDC-IN* power input connector according to the voltage polarity mapping shown below (If a terminal is not already open, loosen its screw). Afterwards, tighten close the three terminal screws.

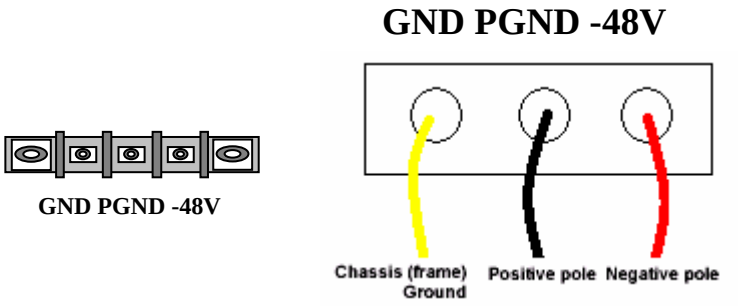


Figure 2-5 DC power connection

Reversing the wire voltage polarity may cause damage to the unit!
Always connect a ground (earth) wire to VDC-IN power input connector Ground terminal. Connecting the unit without a protective ground, or interruption of the grounding (for example, by using an extension power cord without a grounding conductor) can cause harm to the unit or to the equipment connected to it!

NOTE

It can not sustain the voice module

2.2.13.3 Dual power connection

The unit supports 220VAC and –48VDC dual power supply. The system supports 1+1 redundancy protection and each power supply can support the working order of the equipment. Refer to AC and DC connection procedures above for operations.

2.2.13.4 Voice special power module connection

Voice special power offer both AC and DC power using only one module.
It has two transformer modules: 220-48 and 48-5.
The connection of AC power is the same as we introduce in 2.2.11.3. It transform 220V to 48V to supply the voice module and continue transform 48V to 5V to hold out the other card, And its power for the voice module achieve 30 watt almost as twice as the standard AC power. So it can sustain Voice module easily.
The connection of DC power is the same as we introduce in 2.2.11.4. It directly supplies the voice module with no transition, and transform 48V to 5V to hold out the order card.

3 Chapter 3 Operation

This chapter describes the equipment controls and indicators, loopback test.

Installation procedures given in *Chapter 2* must be completed and checked before attempting to operate the unit.

3.1 Front Panel Indicators and Controls

All LED indicators and controls are located on the front panel. Depress a push-button to activate (ON) the corresponding control. Release the push-button to deactivate (OFF) the control. The functions of each push-button and indicator are described as following.

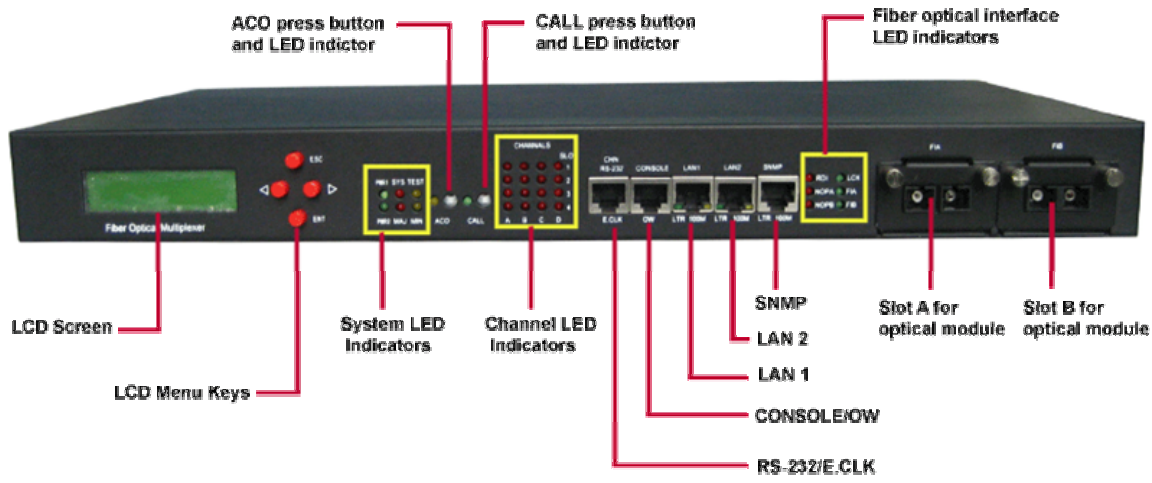


Figure 3-1Front panel

Table 3-1 Front Panel Indicators

Indicators	Color	Function	Status	Description
PWR1	Green	Power indication	On	Power supply 1is normal
			Off	Power supply 1 is absent or invalid
PWR2	Green	Power indication	On	Power supply 2 is normal
			Off	Power supply 2 is absent or invalid
SYS	Red	System self-test failure indication	On	System self-test fails
			Off	System is normal
MAJ	Red	Major alarm indication	On	Local device major alarm indication
			Blinking	Remote device major alarm indication
TEST	Amber	Loop test indication	On	Loop setting or BERT test exists
			Off	No loop setting or BERT test
MIN	Amber	Minor alarm indication	On	Local device minor alarm indication
			Blinking	Remote device minor alarm indication
ACO	Amber	Alarm cut off indication	On	When pressing ACO button to shield sound alarm
			Off	When a new alarm occurs or all alarms disappear

OW	Green	Phone call indication	on	When the opposite OW button was pressed
			off	When the opposite OW button was not pressed
CHANNEL A1-A4, B1-B4, C1-C4, D1-D4,	Red	E1 channel alarm indication for 4*E1 modules, 4*4 matrix, slot1 to slot4 from the top down, A/B/C/D channel for each slot from lest to right	On	Tributary E1 link loss alarm
			Blinking	Tributary E1 link AIS alarm
			Off	Tributary E1 link normal If the corresponding channel is set in “Out of Service” status, the corresponding indicator will be always light
LTR	Green	Ethernet Connect Indication	On	Ethernet connection is normal
			Off	Ethernet connection is abnormal
			Flashing	Ethernet Interface Date RX/TX
100M	Amber	Ethernet Interface Rate indication	On	100M
			Off	10M
RDI	Red	Remote Defect Indication for fiber links	On	When the local TX fiber link is broken and the local RX fiber link is normal, the remote unit will send a link loss signal to the local unit and then the RDI indicator of the local unit will light
			Off	the local TX fiber link is normal
NOPA	Red	A Optic signal loss Indication	On	Fiber A not received optic signal
			Off	Fiber A received optic signal
NOPB	Red	B Optic signal loss Indication	On	Fiber B not received optic signal
			Off	Fiber B received optic signal
LCK	Green	Optical interface APS (Automatic Protection Switch) lock indication	On	When the optical interface switch time is up to 6 in ten minutes, the system will forbid APS function.
			Off	No optical interface
FIA	Green	A Optic interface main indication	On	Fiber A is at main use status
			Off	Fiber A is at standby or no use status
FIB	Green	B Optic interface main indication	On	Fiber B is at main use status
			Off	Fiber B is at standby or no use status

Table 3-2 Front Panel Controls and Ports

Type	State	Function Description
ACO	touch keystoke	Pressing ACO button to shield buzzer alarm and the ACO LED light, and when a new alarm occurs or all alarms disappear the LED down
OW		Order wire call button (State), hang up the order wire phone (State), call out or answer the order wire phone
◁	touch keystoke	LCD control button, go to last option
▷	touch keystoke	LCD control button, go to next option
ENT	touch keystoke	LCD control button, choose the option
EXC	touch keystoke	LCD control button, return back to a previous menu or abandon a setup
RS-232 data and E.CLK input		One clear asynchronous RS-232 data channel and the external clock input interface
CONSOL and OW		One asynchronous RS-232 console port and the order wire telephone interface, connected to COM port of PC for RS-232 console, RJ-45 jack; SNMP agent card configuration, local/remote devices management and maintenance
LAN1~2		2 10/100M Ethernet ports, RJ-45 jacks
SNMP		SNMP management port according to TCP/IP, RJ-45 jack; available only when a SNMP module is installed in the PCB

3.2 LCD operation

All menu keys (push-button switches) and LCD display are located on the Fiber Multiplexer front panel. The pushbutton switches are used to activate menu selections and select parameter settings.

Use the '<' and '>' function keys to browse the menus and select parameters.
Use the '**ENT**' function key to enter a sub-menu or to set a selected parameter.
Use the '**ESC**' function key to return to a previous menu or to abandon setup.

After system initialization, “Menu Select” will be show in LCD. Pressing the **ENT** key at this point will page the operator at the top of the level Menus of the local or remote unit selection. The menu diagram is as following:

Table 3-3 LCD operation menu

Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Local Site /Remote Site	System	Load Default	Load Para Ok! / Load Para Fail!		
		Load Userdefine	Load Para Ok! / Load Para Fail!		
		Save Userdefine	Save Para Ok! / Save Para Fail!		
		LCD light	OFF/30 Sec/5 Min/10 Min		
		Date	Current Date display 2006-05-13	Enter New Date: 2006-10-27	Config Ok! /Invalid Date!
		Time	Current time display 08:09:45	Enter New Time: 16:40:20	Config Ok! /Invalid Time
		External CLK	OFF / E1 PCM / E1 TTL		
		Version	FPGA/Firmware		
	Slot Config	Loopback Time	10 Min /30 Min /1 Hour /5 Hour /24 Hour / Forever		
		All Channels	Loopback	Normal/Loop	
			CH Serevice	In Service/Out Of Service	
			Frame	Unframe/Frame	
		Slot 1/2/3/4 CH A/B/C/D	E1 Channel	Local Loopback	Normal /Loop
				E1 Service	ON /OFF
				Frame	Frame /Unframe
			V35 Channel	V35 Speed	64k~~2048k
				V35 Clock Mode	REC/EXT/INT
				V35 Loop Mode	Normal/DIG Loop/ANA Loop
				Config CTS	ON/Follow
				Config DCD	ON/Follow
				CH Service	In Service / Out Of Service
				Signal Status	RTS/CTS/DTR/ DCD/SYNC
			Voice Channel	Port1	Hang Off/ON
				Port2	Hang Off/ON
				Port3	Hang Off/ON
				Port4	Hang Off/ON
				SYNC	ON/OFF
	Slot Report	Slot 1/2/3/4	No Card		
			4 E1 Card		
			4V35 Card		
			Voice Card		
		SLOT1/2/3/4 CH A/B/C/D	Frame/Unframe		

	Optical Config	Optical A	Work /OFF		
		Optical B	Standby /OFF		
		Switching	Release /Lock		
		ALS	Auto /Disable		
		Local Loopback	Normal /Loop		
		Remote Loopback	Normal /Loop		
		Loopback Time	10 Min /30 Min /1 Hour /5 Hour /24 Hour / Forever		
	LAN Config	Force Mode	ON /OFF		
		Speed	10M /100M		
		Duplex	Half /Full		
		Flow Control	ON /OFF		
		VLAN Setl	ON /OFF		
	Alarm Report	E1 Alarm	Slot 1/2/3/4 A/B/C/D	Normal /LOS /AIS /LOF/No card/No use	
		Optical Alarm	Optical A/B	LOF /LOS /Working /Standby/No card	
		LAN Status	LAN1/LAN2	NO Link /Link AN /Link 10H /Link 100H /Link 10F /Link 100F	
		Alarm Out]	Both /Audible /Visible /All off		
	Threshold Set	CV	255bits /2048bits /65535bits		
		ES	300 Sec /600 Sec /900 Sec		
		SES	300 Sec /600 Sec /900 Sec		
		UAS	300 Sec /600 Sec /900 Sec		
	PM Status	Current	Slot1/2/3/4 CH A/B/C/D	Line CV	
				Line ES	
				Path CV	
				Path ES	
				Path SES	
				Path UAS	
			Optical	Line CV	
				Line ES	
		History Day	1/2/3/4/5/6/7		
		Reset Current	Reset Current PM Ok! / Reset Current PM Fail!		
		Reset All	Reset All PM Ok! / Reset All PM Fail!		

Table 3-4 LCD menu indication

Layer 2 Submenu Indication	
Menu	Indication
System	System configuration
Slot Config	Slot module configuration
Slot Report	Slot module status report
Optical Config	Optical interface configuraton
LAN Config	LAN port configuration
Alarm Report	System alarm report and alarm output configuration
Threshold Set	Performance parameter threshold setting
PM Status	Performance monitor and management
Layer 3 Submenu Indication	
Menu	Indication
Load Default	Restore factory defaults
Load Userdefine	Load the previous saved set
Save Userdefine	Save user-defined set
LCD light	LCD backlight sustaining time configuration
Date	System date inquiry and configuration
Time	System time inquiry and configuration
External CLK	External clock source configuration
Version	System software version inquiry
Loopback Time	Loopback sustaining time configuration
Slot 1/2/3/4	Tributary service slot choosing, for example, slot 1 or slot 2 etc.
Optical A	Fiber optical module in optical slot A
Optical B	Fiber optical module in optical slot B
Switching	Automatic Protection Switching function configuration
Alarm Output	Alarm relay port selection
CV	Code violation
ES	Error second
SES	Severely error second
UAS	Unavailable second
Current	Show performance status of the chose day
History Day	Choose the date for history performance status inquiry
Reset current	Clear the current performance record
Reset All	Clear all the performance record
Layer 4 Submenu Indication	
Load Para Ok!	Load the appointed parameters successfully
Load Para Fail!	Loading the appointed parameters fail
Save Para Ok!	Save the appointed parameters successfully
A/B/C/D	A, B, C or D channel of the slot

Reset Current PM Ok!	Clear the current performance record successfully
Reset Current PM Fail!	Clearing the current performance record fail
Reset All PM Ok!	Clear all the performance record successfully
Reset All PM Fail!	Clearing all the performance record fail
Layer 5 Submenu Indication	
CV	Code violation
ES	Error second
SES	Severely error second
UAS	Unavailable second
Layer 6 Submenu Indication	
Config Ok!	The configuration is successful
Invalid Date/Time!	Enter a wrong format of the date or the time

Note:

1、 Local Site has the same menu with Remote Site, and can configure and supervise the remote unit.

2、 V.35 configuration takes effect when V.35 module is in software control mode.

3、 V.35 configuration takes effect when finished, but must be saved or else it will lose when the FOM is power off.

4、 Ethernet configuration is not available until the configuration is saved and the FOM restarts.

5、 Choose the PM Status of the day you want to see in "History Day" and check it in "Current".

3.3 Hyper Terminal menu

Hyper terminal Configuration Menu realizes not only all the functions of LCD control but also the configuration of SNMP agent module.

The CONSOL port of the unit and the COM port of the PC should be linked through a CTRL cable, for the pin-outs of which refer to the proper section in chapter 2 or supplement 1pinouts. Open the operation system of PC, and choose "Start" – "Program" – "Accessory" – "Communication" – "Hyper terminal", to log in the system.

The setting of hyper terminal:

- Rate: 19200bps
- Data bit: 8
- Parity bit: non
- Stop bit: 1
- Flow control: non

The Hyper Terminal menu is similar as the LCD one except that the Hyper Terminal menu has a choice for SNMP agent module management.

When login the system, the top menu will show as follows:

Menu Select:

1. Local Login

2. Remote Login

Input the option number in front of the option to enter the choice and press "Esc" in the PC keyboard to return to the previous menu. When a login password has been set, you need input the right password to continue.

Table 3-5 Hyper Terminal operation menu

Layer 1	Layer 2	Layer 3	Layer 4	Layer 5	Layer 6
Local Login /Remote Login	System Config	Load Default	Load Para Ok! / Load Para Fail!		
		Load Userdefine	Load Para Ok! / Load Para Fail!		
		Save Userdefine	Save Para Ok! / Save Para Fail!		
		Modify Password	NOTE: input a 6-character password		
		LCD light	OFF/30 Sec/5 Min/10 Min		
		Date	Current Date display 2007-01-01	Input New Date: - -	Config Ok! /Invalid Date!
		Time	Current time display 12:12:12	Input New Time: : :	Config Ok! /Invalid Time
		External CLK	OFF / E1 PCM / E1 TTL		
	Slot Config	Loopback Time	10 Min /30 Min /1 Hour /5 Hour /24 Hour / Forever		
		Slot 1/2/3/4 (4*E1 / V.35/4*FXS/4*FXO)	A/B/C/D	Local Loopback	Normal /Loop
				E1 Service	ON /OFF
				Frame	Frame /Unframe
	Optical	Optical A	Work /OFF		

	Config	Optical B	Standby /OFF			
		Switching	Release /Lock			
		ALS	Auto /Disable			
		Local Loopback	Normal /Loop			
		Remote Loopback	Normal /Loop			
		Loopback Time	10 Min /30 Min /1 Hour /5 Hour /24 Hour / Forever			
	LAN Config	Force Mode	ON /OFF			
		Speed	10M /100M			
		Duplex	Half /Full			
		Flow Control	ON /OFF			
		VLAN Set	ON/OFF			
	Alarm Report	Show System Status	E1 Alarm: Slot 1/2/3/4 A/B/C/D----Normal /LOS /AIS /LOF			
			Optical Alarm: Optical A/B----LOF /LOS /Working /Standby			
			LAN Status: LAN1/2----NO Link /Link AN /Link 10H /Link 100H /Link 10F /Link 100F			
		Alarm Output	Both /Audible /Visible /All off			
	PM Threshold Set	CV	255bits /2048bits /65535bits			
		ES	300 Sec /600 Sec /900 Sec			
		SES	300 Sec /600 Sec /900 Sec			
		UAS	300 Sec /600 Sec /900 Sec			
	PM Status Report	Show PM Status	Currenr 15min/ Current day/ History 1-5 day	Slot 1/2/3/4 A/B/C/D	Line CV	
					Line ES	
					Line SES	
					Line UAS	
				Optical	Line CV	
					Line ES	
					Line SES	
					Line UAS	
		Reset Current	Reset Current PM Ok! / Reset Current PM Fail!			
		Reset All	Reset All PM Ok! / Reset All PM Fail!			
	SNMP Config	IP Address	Set SNMP IP Addr:			
		Subnett Mask	Set SNMP Subnet Mask:			
		Gateway IP	Set SNMP Gateway IP Addr:			
		Trap IP #1	Set SNMP Trap IP # 1 :			
		Trap IP #2	Set SNMP Trap IP # 2 :			
		Trap IP #3	Set SNMP Trap IP # 3 :			
		Trap IP #4	Set SNMP Trap IP # 4 :			
		MAC Address	Set SNMP MAC Address:			
		Read Community String				

		Write Community String	
		Trap Community String	
		Save and Restart	
		Update SNMP Firmware	
	Logout		

3.4 Loop test

The equipment provides bidirectional E1 port and optical port loopback for both local and remote units. This can be done by both LCD control and Dip-switch in the 4E1 module.

3.4.1 Local loopback

The local loopback test in the operated local unit commands the local unit to make a loop in tributary E1circuit or optical circuit. The local loopback test checks the performance of the local and remote units, the local and remote data terminal, and the connections between them.

When setting a local E1 loop in unit A, the loop directions in unit A are for both the local and the remote tributary E1.

When setting a local optical loop in unit A, the loop directions in unit A is only for the local a optical ports.

A local loop setting is shown as following.

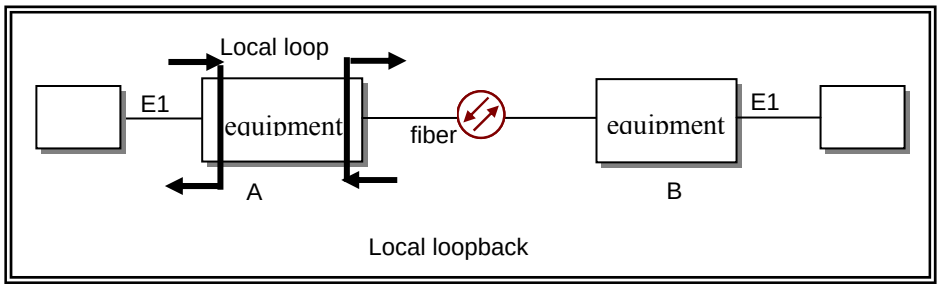


Figure 3-2 E1 Local loop setting

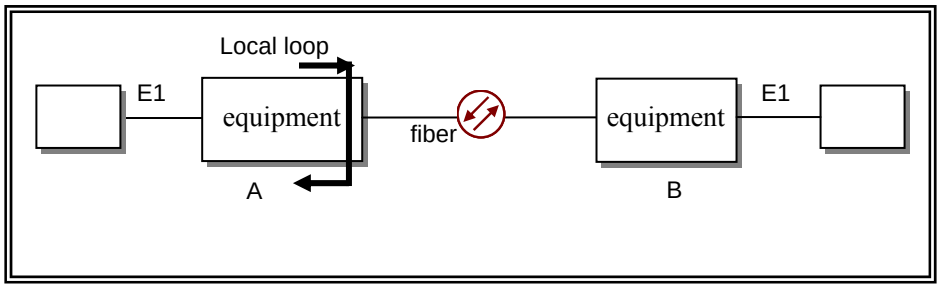


Figure 3-2 optical Local loop setting

3.4.2 Remote loopback

The remote loopback test in the local operated unit commands the remote unit to make a loop in tributary E1circuit or optical circuit. The remote loopback test function is similar to the local loopback.

When setting a local E1 loop in unit A, the loop directions in unit B are for both the local and the remote tributary E1.

When setting a local optical loop in unit A, the loop directions in unit A is only for local optical ports from remote.

A remote loop setting is shown as following.

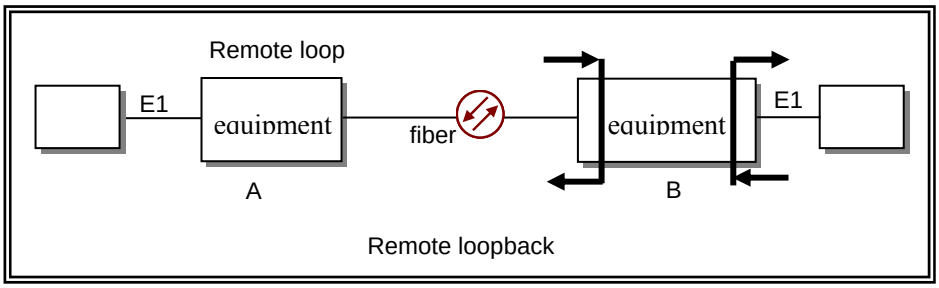


Figure 3-4 E1 Remote loop setting

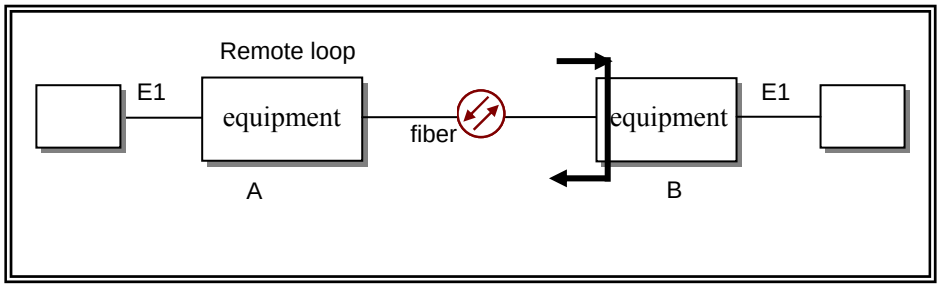


Figure 3-4 ***optical*** Remote loop setting

4 Chapter 4 Troubleshooting

This chapter provides troubleshooting instructions for the equipment.

Note

The installation procedures described in this chapter must be performed by authorized service personnel, aware of the hazards involved. The personnel in equipment troubleshooting must strictly observe all the safety precautions related to the installation of communication equipment.

Dangerous voltages that may cause death or injury on contact are present inside the equipment enclosures, and on line cards installed in the NIC-IRACK, when connected to power and /or to E1 lines. Do not open enclosures and do not touch internal components when still connected to cables. Always disconnect all the cables connected to the system before disconnecting the earth connection.

The unit contains components sensitive to electrostatic discharge (ESD). To prevent ESD damage, avoid touching the internal components, and before moving jumpers, touch the frame of and earthed equipment.

Table 4-1 Troubleshooting Procedure

No.	Symptom	Probable Cause	Corrective Actions
1.	Power indicator is off	Power supply is not available; The switch of the power supply is not open; The connect of the power supply is not tight;	Change the power supply; Open the switch of the power supply; Screw down the power supply;
2.	NOP alarm indicators is on	If self loop of the optical ports is normal and the connection of the optical cables is right, the optical cables has trouble or the distance is too long; Otherwise the TX and RX optical interface connection is reverse;	Change the optical cables; Change a long distance optical module; Exchange the TX and RX fiber cables;
3.	The equipment of One side of the optic connection is normal, and other has NOP alarm	Self loop separately, the equipment that has NOP alarm has trouble Otherwise the RX fiber cable has trouble	Contact with your support representative Change the optical cables
4.	Ethernet transmit has serious data package loss	The RJ45 connector has a bad contact FULL/HALF duplex is not matching	Check the Ethernet port contact Change the Ethernet cable Check the duplex matching
5.	E1 interface alarms	Coaxial connector has trouble The E1 equipment is powered off The E1 TX and RX interface connection is reverse; The alarm of tributary E1 is not masked	Adjust the coaxial connector Open the E1 equipment that connect to the unit; Exchange the TX and RX interface connectors; Press the “MASK” button to mask the tributary E1 alarm;
6.	E1 interfaces have bit errors	Impedance is not matching E1 cables is too long The E1 connector has a bad contact 120Ω connect cable is not twisted E1 terminal unit is not common earth with the optical multiplexer	Affirm the impedance of the E1 equipment is same of the optical multiplexer; Affirm the distance of the E1 cable is no longer than 200 meters; Adjust the E1 connector Affirm the 1,2 pin of the RJ45(120Ω) is twisted, and the 4,5 pin is another twisted; Affirm the earth of the E1 terminal unit and the optical multiplexer is according to the electrician standard;

5 Supplement

5.1 Pin-outs

DB-37 Connecter Pin-outs

DB-37 (Female)	Function explanation	Q9, CC3, CC4	RJ-45 (Male)	RJ-45 (Female)
21	Path1 E1 Receive Data Input+	RX1	1	4
3	Path1 E1 Receive Data Input-		2	5
4	Path1 E1 Transmit Data Output+	TX1	4	1
22	Path1 E1 Transmit Data Output-		5	2
25	Path2 E1 Receive Data Input+	RX2	1	4
7	Path2 E1 Receive Data Input-		2	5
8	Path2 E1 Transmit Data Output+	TX2	4	1
26	Path2 E1 Transmit Data Output-		5	2
29	Path3 E1 Receive Data Input+	RX3	1	4
11	Path3 E1 Receive Data Input-		2	5
12	Path3 E1 Transmit Data Output+	TX3	4	1
30	Path3 E1 Transmit Data Output-		5	2
33	Path4 E1 Receive Data Input+	RX4	1	4
15	Path4 E1 Receive Data Input-		2	5
16	Path4 E1 Transmit Data Output+	TX4	4	1
34	Path4 E1 Transmit Data Output-		5	2
23	Path5 E1 Receive Data Input+	RX5	1	4
5	Path5 E1 Receive Data Input-		2	5
6	Path5 E1 Transmit Data Output+	TX5	4	1
24	Path5 E1 Transmit Data Output-		5	2
27	Path6 E1 Receive Data Input+	RX6	1	4
9	Path6 E1 Receive Data Input-		2	5
10	Path6 E1 Transmit Data Output+	TX6	4	1
28	Path6 E1 Transmit Data Output-		5	2
31	Path7 E1 Receive Data Input+	RX7	1	4
13	Path7 E1 Receive Data Input-		2	5
14	Path7 E1 Transmit Data Output+	TX7	4	1
32	Path7 E1 Transmit Data Output-		5	2
35	Path8 E1 Receive Data Input+	RX8	1	4
17	Path8 E1 Receive Data Input-		2	5
18	Path8 E1 Transmit Data Output+	TX8	4	1
36	Path8 E1 Transmit Data Output-		5	2

RJ-45 Pin-outs for Cat 5 EIA/TIA-568-A

Pin	Tip/Ring Color	Pair
1	White/Green	Pair 3
2	Green	Pair 3
3	White/Orange	Pair 2
4	Blue	Pair 1
5	White/Blue	Pair 1
6	Orange	Pair 2
7	White/Brown	Pair 4
8	Brown	Pair 4

RJ-45 Pin-outs for Cat 5 EIA/TIA-568-B

Pin	Tip/Ring Color	Pair
1	White/Orange	Pair 2
2	Orange	Pair 2
3	White/Green	Pair 3
4	Blue	Pair 1
5	White/Blue	Pair 1
6	Green	Pair 3
7	White/Brown	Pair 4
8	Brown	Pair 4

DB-62 Connecter Pin-outs

DB-37 (Female)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
V.35 circuit	RC 3 B	RD3 A	TD 3 A	ETC 3B	TC2 B	ET C2 A	TD 2 B	RC 2 B	RD 2 A	RC1 B	RD1 A	TD1 A	ETC 1B	DC D1	DT R1	R C0 B
DB-37 (Female)	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
V.35 circuit	RD 0 A	ETC 0A	TD 0B	DC D0	DT R0	TC 3 B	RC 3 A	RD 3 B	TD 3 B	ET C3A	TC2 A	ETC 2B	TD2 A	RC2 A	RD 2 B	R C1 A
DB-37 (Female)	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
V.35 circuit	RD 1 B	TD1 B	ET C1 A	RTS 1	CT S1	RC 0 A	RD 0 B	ET C0 B	TD 0 A	RTS 0	TC3 A	GND 3	RTS 3	DC D3	DS R23	D TR 3
DB-37 (Female)	49	50	51	52	53	54	55	56	57	58	59	60	61	62		
V.35 circuit	CT S3	GN D2	DC D2	RTS 2	DT R2	CT S2	GN D1	DS R0 1	TC 1 B	TC1 A	GND 0	TC0 A	TC0 B	CTS 0		

Note:

1. **There are 4 channels of signal, each with the same number;**
2. **GND is the Signal Ground;**
3. **The DSR of channel one and channel two share the same pin 56, the DSR of channel three and channel four share the same pin 47.**

M34 adaptor cable pin out for V35

Signal Function	M34 Pin#	V.35 circuit	Direction	Description
Frame Ground	**A**	Frame	<->	Chassis ground. May be isolated from signal ground.
Signal Ground	**B**	Signal Ground	<->	Common signal ground.
Transmit Data	**P** **S**	TD(A) TD(B)	To ***MUX UNIT***	Serial digital data from DTE.
Receive Data	**R** **T**	RD(A) RD(B)	Fm. ***MUX UNIT***	Serial digital data at the output of the ***Fiber Multiplexer*** receiver.
Transmit Clock	**Y** **AA**	TC(A) TC(B)	Fm. ***MUX*** UNIT	A transmitted data rate clock for use by an external data source.
Receive Clock	**V** **X**	RC(A) RC(B)	Fm. ***MUX UNIT***	A received data rate clock for use by an external data source.
External Transmit Clock	**U** **W**	ETC(A) ETC(B)	To ***MUX UNIT***	A transmitted data rate clock input from the data source.
Request To Send	**C**	RTS	To ***MUX UNIT***	An ON signal to the ***Fiber Multiplexer*** when data transmission is desired.
Clear To Send	**D**	CTS	Fm. ***MUX UNIT***	Constantly ON.
Data Set Ready	**E**	DSR	Fm. ***MUX UNIT***	Constantly ON, Except during test loops.
Data Carrier Detect	**F**	DCD	Fm. ***MUX UNIT***	Constantly ON, except when a loss of the received carrier signal is detected.
Data Terminal Ready	**H**	DTR	To ***MUX UNIT***	DTR not used, used for a received serial data rate clock input from the DTE.
Remote Loopback	**HH**	RL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into remote loop back.
Local Loopback	**JJ**	LL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into local loop back.
Test Indicator	**KK**	TM	Fm. ***MUX UNIT***	ON during any test mode

DB-15 adapter cable Pin out for X.21

Signal Function	DB-15 Pin#	Abbreviation	Direction	Description
Shield	**1**	FG	<->	Chassis ground. May be isolated from signal ground.
Ground	**8**	SG	<->	Common signal ground.
Transmit(A) Transmit(B)	**2** **9**	TD(A) TD(B)	To ***MUX UNIT***	Serial digital data from DTE.
Receive(A) Receive(B)	**4** **11**	RD(A) RD(B)	Fm. ***MUX UNIT***	Serial digital data at the output of the ***Fiber Multiplexer*** receiver.
Control(A) Control(B)	**3** **10**	RTS(A) RTS(B)	To ***MUX UNIT***	An ON signal to the ***Fiber Multiplexer*** when data transmission is desired.
Indication(A) Indication(B)	**5** **12**	DCD(A) DCD(B)	Fm. ***MUX UNIT***	Constantly ON, except when a loss of the received carrier signal is detected.
Ext. Timing(A) Ext. Timing(B)	**7** **14**	ETC(A) ETC(B)	To ***MUX UNIT***	A transmitted data rate clock input from the data source.
Signal Timing(A) Signal Timing(B)	**6** **13**	RC(A) RC(B)	Fm. ***MUX UNIT***	A received data rate clock for use by an external data source.

DB37 adapter cable pin out for RS-449

Signal Function	DB-37 Pin#	RS-449 circuit	Direction	Description
Protective Ground	**1**	Frame	<->	Chassis ground. May be isolated from signal ground.
Signal Ground	**19, 20, 37**	SG, RC, SC	<->	Common signal ground.
Transmitted Data	**4** **22**	SD(A) SD(B)	To ***MUX UNIT***	Serial digital data from DTE.
Received Data	**6** **24**	RD(A) RD(B)	Fm. ***MUX UNIT***	Serial digital data at the output of the ***Fiber Multiplexer*** receiver.
Request to Sent	**7** **25**	RS(A) RS(B)	To ***MUX UNIT***	An ON signal to the ***Fiber Multiplexer*** when data transmission is desired.
Clear to Sent	**9** **27**	CS(A) CS(B)	Fm. ***MUX UNIT***	Constantly ON.
Data Set Ready	**11** **29**	DM(A) DM(B)	Fm. ***MUX UNIT***	Constantly ON, Except during test loops.
Data Terminal Ready	**12** **30**	TR(A) TR(B)	To ***MUX UNIT***	DTR not used, used for a received serial data rate clock input from the DTE.
Data Carrier Detect	**13** **31**	RR(A) RR(B)	Fm. ***MUX UNIT***	Constantly ON, except when a loss of the received carrier signal is detected.
External Transmit clock	**17** **35**	TT(A) TT(B)	To ***MUX UNIT***	A transmitted data rate clock input from the data source.
Transmit Clock	**5** **23**	ST(A) ST(B)	Fm. ***MUX UNIT***	A transmitted data rate clock for use by an external data source.
Receive Clock	**8** **26**	RT(A) RT(B)	Fm. ***MUX UNIT***	A received data rate clock for use by an external data source.
Remote Loop back	**14**	RL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into remote loop back.
Local Loop back	**10**	LL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into localloop back.
Test Indicator	**18**	TM	Fm. ***MUX UNIT***	ON during any test mode

DB25 adapter cable pin out for RS-530

Signal Function	DB-25 Pin#	RS-530 circuit	Direction	Description
Protective Ground	1	Frame	<->	Chassis ground. May be isolated from signal ground.
Signal Ground	7	AB	<->	Common signal ground.
Transmitted Data	2 14	BA(A) BA(B)	To ***MUX UNIT***	Serial digital data from DTE.
Received Data	3 16	BB(A) BB(B)	Fm. ***MUX UNIT***	Serial digital data at the output of the ***Fiber Multiplexer*** receiver.
Request to Sent	4 19	CA(A) CA(B)	To ***MUX UNIT***	An ON signal to the ***Fiber Multiplexer*** when data transmission is desired.
Clear to Sent	5 13	CB(A) CB(B)	Fm. ***MUX UNIT***	Constantly ON.
Data Set Ready	6 22	CC(A) CC(B)	Fm. ***MUX UNIT***	Constantly ON, Except during test loops.
Data Terminal Ready	20 23	CD(A) CD(B)	To ***MUX UNIT***	DTR not used, used for a received serial data rate clock input from the DTE.
Data Carrier Detect	8 10	CF(A) CF(B)	Fm. ***MUX UNIT***	Constantly ON, except when a loss of the received carrier signal is detected.
External Transmit clock	24 11	DA(A) DA(B)	To ***MUX UNIT***	A transmitted data rate clock input from the data source.
Transmit Clock	15 12	DB(A) DB(B)	Fm. ***MUX UNIT***	A transmitted data rate clock for use by an external data source.
Receive Clock	17 9	DD(A) DD(B)	Fm. ***MUX UNIT***	A received data rate clock for use by an external data source.
Remote Loop back	21	RL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into remote loop back.
Local Loop back	18	LL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into localloop back.
Test Indicator	25	TM	Fm. ***MUX UNIT***	ON during any test mode

DB25 adapter cable pin out for RS-232

Signal Function	DB-25 Pin#	RS-530 circuit	Direction	Description
Protective Ground	1	AA	<->	Chassis ground. May be isolated from signal ground.
Signal Ground	7	AB	<->	Common signal ground.
Transmitted Data	2	BA	To ***MUX UNIT***	Serial digital data from DTE.
Received Data	3	BB	Fm. ***MUX UNIT***	Serial digital data at the output of the ***Fiber Multiplexer*** receiver.
Request to Sent	4	CA	To ***MUX UNIT***	An ON signal to the ***Fiber Multiplexer*** when data transmission is desired.
Clear to Sent	5	CB	Fm. ***MUX UNIT***	Constantly ON.
Data Set Ready	6	CC	Fm. ***MUX UNIT***	Constantly ON, Except during test loops.
Data Terminal Ready	20	CD	To ***MUX UNIT***	DTR not used, used for a received serial data rate clock input from the DTE.
Data Carrier Detect	8	CF	Fm. ***MUX UNIT***	Constantly ON, except when a loss of the received carrier signal is detected.
External Transmit clock	24	DA	To ***MUX UNIT***	A transmitted data rate clock input from the data source.
Transmit Clock	15	DB	Fm. ***MUX UNIT***	A transmitted data rate clock for use by an external data source.
Receive Clock	17	DD	Fm. ***MUX UNIT***	A received data rate clock for use by an external data source.
Remote Loop back	21	RL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into remote loop back.
Local Loop back	18	LL	To ***MUX UNIT***	When on, commands ***Fiber Multiplexer*** into localloop back.
Test Indicator	25	TM	Fm. ***MUX UNIT***	ON during any test mode

5.2 Appendix

5.2.1 DB37F-Q9F*4

DB37F-Q9F*4 is a interface adapter from DB37 female connector to BNC female connectors, used for connecting the FOM480 and the tributary E1 equipment.

*Figure 5-1 DB37F-Q9F*4 adapter*

5.2.2 DB37F-Q9M*4

DB37F-Q9M*4 is a interface adapter from DB37 female connector to BNC male connectors, used for connecting the FOM480 and the tributary E1 equipment.

*Figure 5-2 DB37F-Q9M*4 adapter*

5.2.3 DB62F-M34M*4

DB62F-M34M*4 is a interface adapter from DB62 female connector to M34 male connectors, used for connecting the FOM480 and the tributary V35 equipment.

Figure 5-3 DB62F-M34M*4 adapter